Alternatives to Demolition

OPPORTUNITIES FOR COMMUNITY PARTNERSHIPS

Army Worldwide Environmental and Energy Conference

Atlanta, GA

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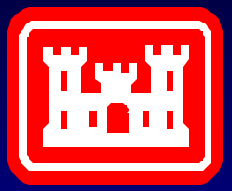
Session Participants

Ron Webster



US Army Corps
of Engineers

Tom Napier
Steve Cosper

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Center for Construction
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EXCESS ARMY FACILITIES: CURRENT PROBLEM

DEFENSE PLANNING:

Disposal of over 53 Million Square Feet
Enlisted and Officer Housing
Storage Facilities
Administrative Buildings

COSTS OF LANDFILL DISPOSAL:

$9 per square foot
60-70% of an Installation's Solid Waste Generation

Potential Bill:

Over $350 Million

RW

ALTERNATE SOLUTION:
A Partnership with Habitat for Humanity

Potential Costs of $6-7 per square foot

Partners:

HABITAT FOR HUMANITY
ENVIRONMENTAL PROTECTION AGENCY (EPA)
HOUSING AND URBAN DEVELOPMENT (HUD)
DEPARTMENT OF LABOR (DOL)
DEPARTMENT OF AGRICULTURE
Forest Products Laboratory
Rural Development Administration
DEPARTMENT OF TRANSPORTATION

TWO MODES OF RE-UTILIZATION:
Intact Relocation
Deconstruction and Salvage

PILOT PROJECTS:

REDSTONE PILOT (Huntsville, Alabama)

Relocation (As Opposed to Demolition)
86 Duplexes
Cost Savings: $3k per building + landfill costs
1959 Wherry Housing (Brick on Slab)
197 Tons (including slab)
Unique Moving and Foundation Requirements
Potential Relocation of 7 Units to the Delta

FORT HOOD PILOT (Austin, Texas)

Austin RE-store proposal to Fort Hood
$6.00 per foot ($3.00 per foot savings)

Re-sale of materials to fund housing construction
(1999 Results: $600k from $1million gross)

PILOT PROJECTS (continued):

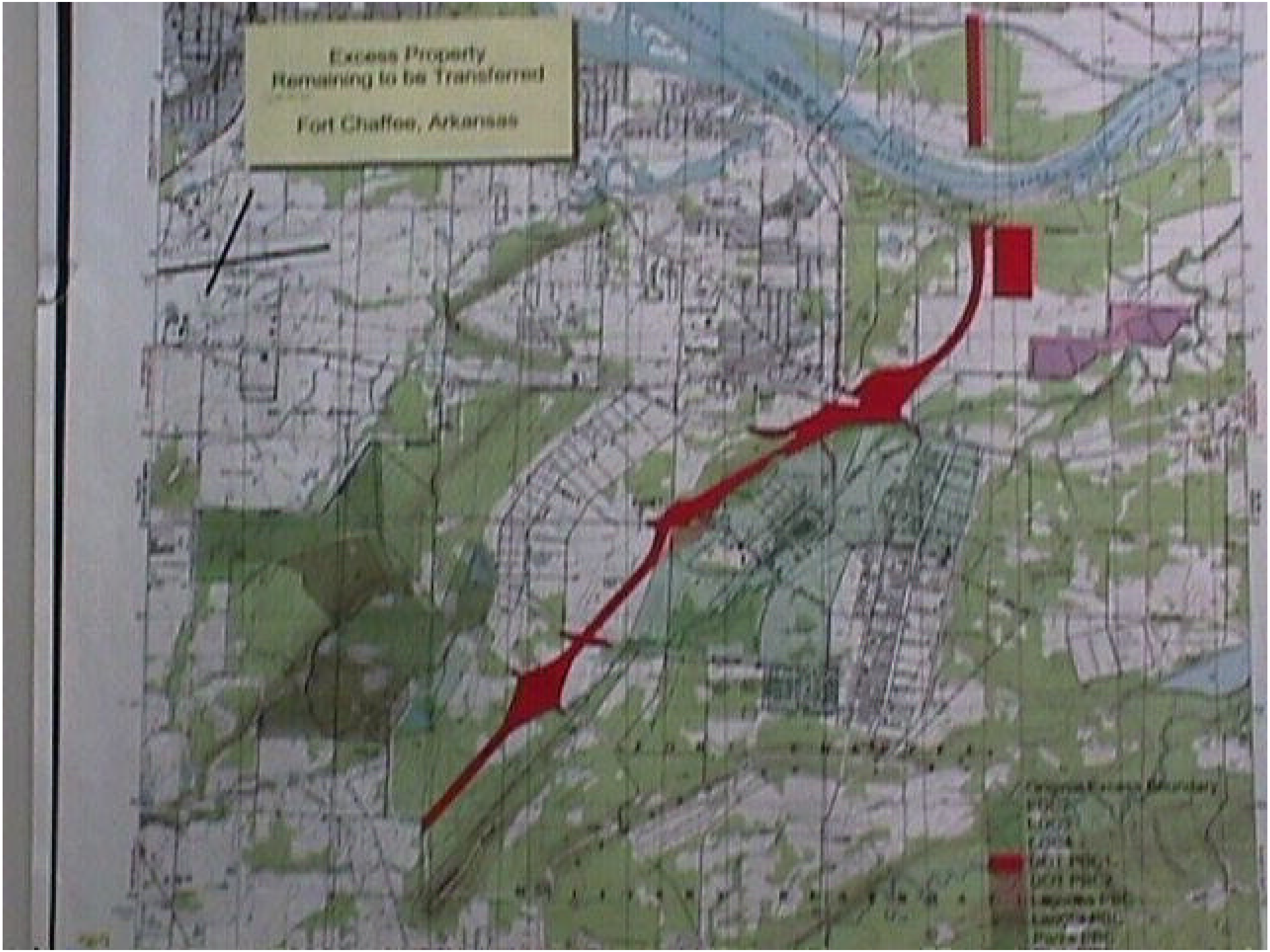
FORT CHAFFEE PILOT (Fort Smith, Arkansas)

Proposal from the Austin RE-store
Negotiated with Fort Chaffee Local Redevelopment Authority
Over 600 large buildings
Over 10 million board feet of old-growth wood
Large amount of salvageable siding
Salvagable windows, doors, etc.

Fort Chaffee Redevelopment Authority

- Designated LRA (BRAC)
- First conveyance 15 November 2000
- Accelerating project

PR


Excess Property
Remaining to be Transferred
Fort Chaffee, Arkansas

Fort Chaffee Redevelopment Authority

- Active status
- The Problem
- Test area

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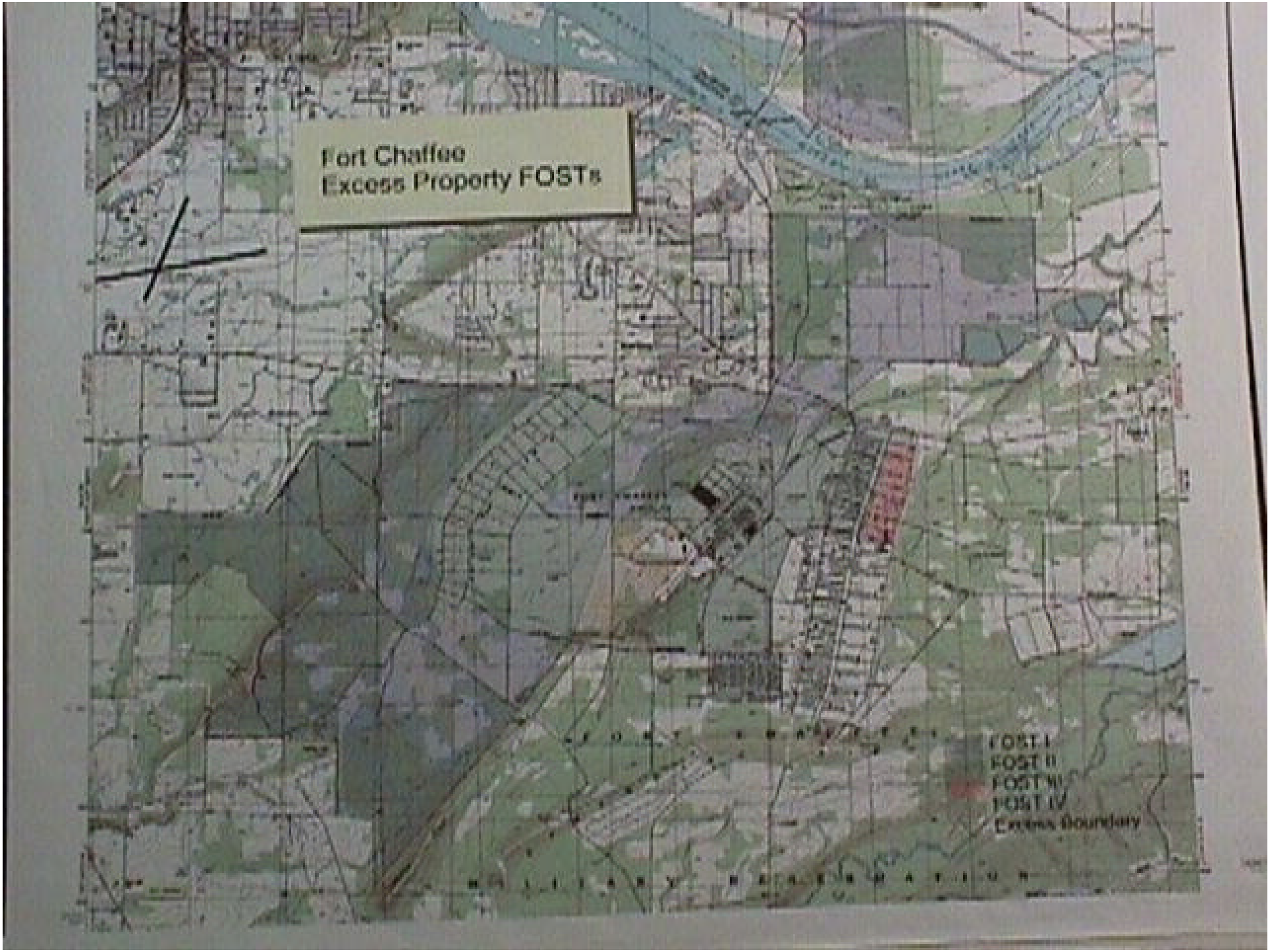

Fort Chaffee
Excess Property FOSTs
FOST I
FOST II
FOST III
FOST IV
Fence Boundary

Standard Practice

TN

CERL Support to BRAC Office

- Develop cost analyses
  - Budget-level cost estimate to remove the buildings
  - Technologies for reducing debris volume
  - Cost reduction methods
- Provide information to Fort Chaffee Redevelopment Authority
- Also … promote a more environmentally sensitive disposition of the buildings
  - i.e. Recover, Reuse, Recycle ….. *Deconstruct*

Liability or Asset?

- "One man's trash is another man's treasure"

Some Reactions to Suggesting "Deconstruction"

- "They're all trash ..."
- "Nothing valuable..."
- "Tried it. 'Can't be done!"
- "Fort Chaffee isn't Fort Ord"
- "It'll take too long."
- *"BURN 'EM!"*

Developing Demolition Estimates

- Inventory buildings & contents
  - Building inventory
  - Construction, materials
- Assemble Cost data
  - Published data (MCACES, JOC UPB, R.S. Means)
  - Asbestos / HazMat consultants
  - Historic data
  - Contractor quotes*

Demolition Estimates, cont'd

- Demolition & landfill: $18.7M
  - Incl. Abatement, sitework, & other contract costs
  - $4.3M for abatement
  - $5.1M for building demolition
  - $2.5M for hauling and landfilling
- Demolition & incineration: $17.1M
  - Similar to above
  - But not feasible per Arkansas Department of Environmental Quality

Why Even Consider Deconstruction?

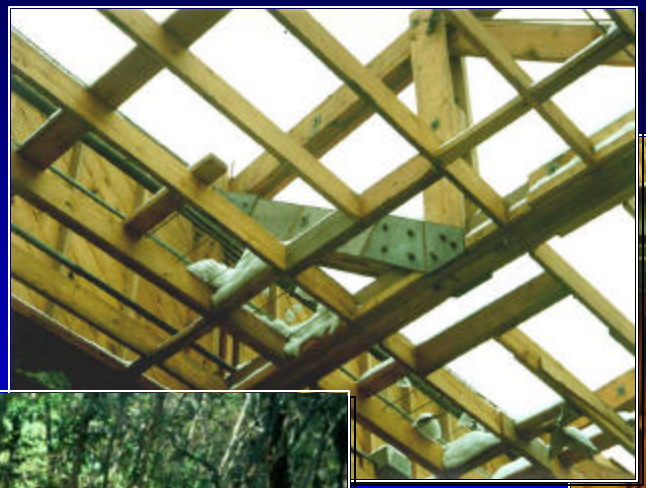
Recoverable Materials

Examples Materials & Quantities

- 350 T steel siding
- 12,000 old doors & windows
- 4,000 new doors & windows
- 200 new coil overhead doors
- 15,000,000 BF lumber

All values approximate

Successful Examples



*Contractor Quotes

- Some other responses
  - " …. But ***I*** get to keep the debris"
  - "We took the boilers out of the ones we demolished earlier"
  - "I'll give ya fifty-bucks each for the small buildings"
- Suggests there ***IS*** value in these buildings

Can Deconstruction Save Any Money?

- That depends on ….
  - Contents
  - Cost to recover materials
  - Value of recovered materials
  - Disposal cost
- A question of balance
  - Favorable ?
  - Unfavorable?

Determining *De*construction Costs

- Limited historic data
  - $0.12 - $2.28/SF less than demolition (AFCEE)
  - $1.35/SF less than demolition (Fort Ord)
  - Others
- No extensive, dependable databases
  - Deconstruction costs
  - Salvage values

Deconstruction Costs, cont'd

- Modeled buildings' construction & content
  - Seven major building types; at least 75% of building inventory
  - Representative content
    - Concrete
    - Wood materials
    - Brick
    - Metals
    - HVAC, pluming, & electrical components
    - Windows, doors, fixtures
    - Other recoverable items

Deconstruction Costs, cont'd

- Applied available cost & productivity data
  - Published sources (R.S. Means)
  - Army data (JOC Unit Price Book, "Demo" column)
- Estimated deconstruction costs
  - Approx. $5+/SF to "deconstruct"
  - Approx. 3.1 SF/LH*
- Compared with case study data
  - $5-6+/SF historical cost for deconstruction projects
  - Approx. 3.0 SF/LH*

*Labor Hours, formerly Man Hours

Determining Recovered Materials' Values

- Even more limited data
- Consulted Sources
  - Habitat for Humanity *ReStores*
  - Local quotes
  - Industry sources (primarily through Forest Products Lab)
- Estimated Values
  - Materials & components: roughly 50% of retail (rule of thumb)
  - Lumber: $250/MBF

Data Compiled

- Benchmark demolition cost
- Building construction & contents
  - Recoverable materials quantities
  - Debris to landfill
- Cost to “deconstruct”
  - Productivity; LH requirements & rates
  - Selective demolition costs
- Value of recovered materials
  - Lumber
  - Other materials & components

Estimated Cost Impacts
(Contract Scenario)

- **Cherry Picking**
  - **Salvage cost** **$ 27K**
  - **Value** **$498K**
  - ***Net savings*** ***$471K***
- **Extensive salvage**
  - **Salvage cost** **$183K**
  - **Value** **$854K**
  - **Cost avoidance** **$237K**
  - ***Net savings*** ***$908K***

Cost Impacts, cont'd

- Complete deconstruction
  - Salvage cost $9.2M
  - Value $4.5M
  - Cost avoidance $6.8M
  - ***Net savings*** ***$2.1M***

  - Also … potential for almost $2M cost avoidance by using concrete rubble in lieu of quarried gravel at $10/T

Implementation Method

- Confident there ***IS*** value to the buildings
- But still some uncertainty

Implementation Method, cont's

- Recommend the Fort Chaffee Redevelopment Authority issue a *Request For Proposal*
  - Solicits proposals for removing buildings, instead of prescribing a single approach
  - Allows best overall solution to emerge
  - Encourages innovation
  - Encourages participation by "non-traditional" parties

Can This Example be Applied to the Army?

- Developed within BRAC context
- Can be adapted to Facility Reduction requirements
- A standard practice as opposed to prototype or one-off project

Demolition Requirements

- C&D waste generation *WILL* increase
  - Facility Reduction Program
    - Army's goal 53.2 million SF by FY 2003
  - MCA "one for one" requirement
  - Base Realignment and Closure
  - New Construction
    - Barracks/Family housing modernization
    - Motor Pool Modernization
    - Objective Force conversion
- * Environment vs. Construction--DPW functions*

Alternatives to Demolition- Success Stories

- University of Florida Center for Construction & Environment
- Riverdale, MD
- Ft. Ord, CA
- Presidio of San Francisco, CA
- Ft. McCoy, WI
- Alameda NAS, CA
- Austin Habitat for Humanity
- Fort Chaffee
- 20 case studies (AFCEE C&D Waste Management Guide)
- Twin Cities AAP

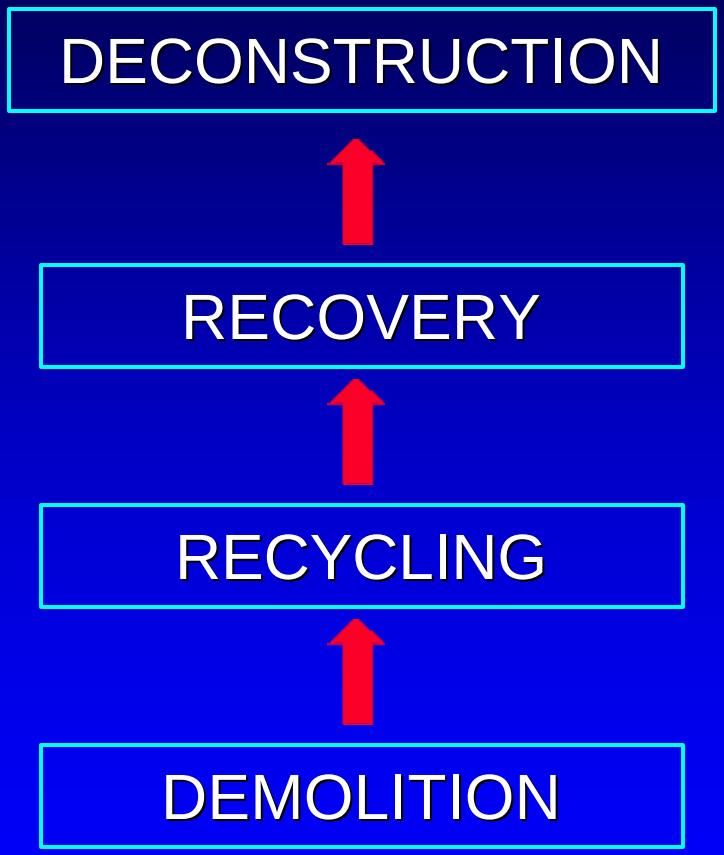
Results

- Waste diversion of 50% to 98%
- Cost avoidance of a few cents to $4 or $5 / SF of building
- Value of recovered materials offsets additional expenses of recovery
- Value of recovered materials can *GENERATE INCOME* for the Owner

Confidence In Repeatability?

- **Uncertainty is present with …**
  - Motivation & requirements of the Owner
  - Local markets & economic conditions
  - Personnel & personalities
  - Construction estimating data
  - Prevailing practices & attitudes
  - Local regulatory constraints

Alternative Methods of Building Removal



Deconstruction

- Systematic dismantling of a building, preserving the integrity of the materials, with the goal of maximizing the recovery of salvageable materials for potential reuse and recycling

Recycling

- Diverting materials that are not reusable from the solid waste stream and using these extracted materials as feedstock for reprocessing into other useful products

Trade Offs

- ***COST***
  - Demolition lowest first cost, but add landfill fees and long term liability
  - Deconstruction can generate income to offset effort
- ***Time***
  - Demolition has shortest time requirement
  - Deconstruction requires most time
  - *Contracting more complex/unfamiliar*
    - *Break down tasks, e.g., utilities, asbestos, building removal, site restoration*

Deconstruction Cost Savings in Army Case Studies

- **Fort McCoy, Wisconsin**
  - **Commercial Demolition: $40,000 each bldg**
  - **Building Deconstruction: $2,000 - $4,000 ea.**

Theater at Fort McCoy

Theater Trusses

Mess Hall Under Deconstruction

Reused Wood from McCoy

Twin Cities Army Ammunition Plant

- Closed industrial installation
- Several large building with heavy timber construction
- Several buildings deconstructed

Building

	501	503
Floor Space	377,000 ft^2	548,000 ft^2
Timber	1,250,000 bf	1,875,000 bf
Wood Recycled	750,000 bf (60%)	1,500,000 bf (80%)
Transportation & Tipping Fees Avoided	$35,000	$70,000
Future Liability Avoided	?	?

TCAAP

Building

	501	503
Cost to Demolish & Landfill	$300,000	$440,000
Cost to Deconstruct	$50,000[a]	$283,000[b]
SAVINGS	**$250,000**	**$157,000**

[a] Roofing disposal not part of deconstruction contract.

[b] Roofing disposal part of deconstruction contract.

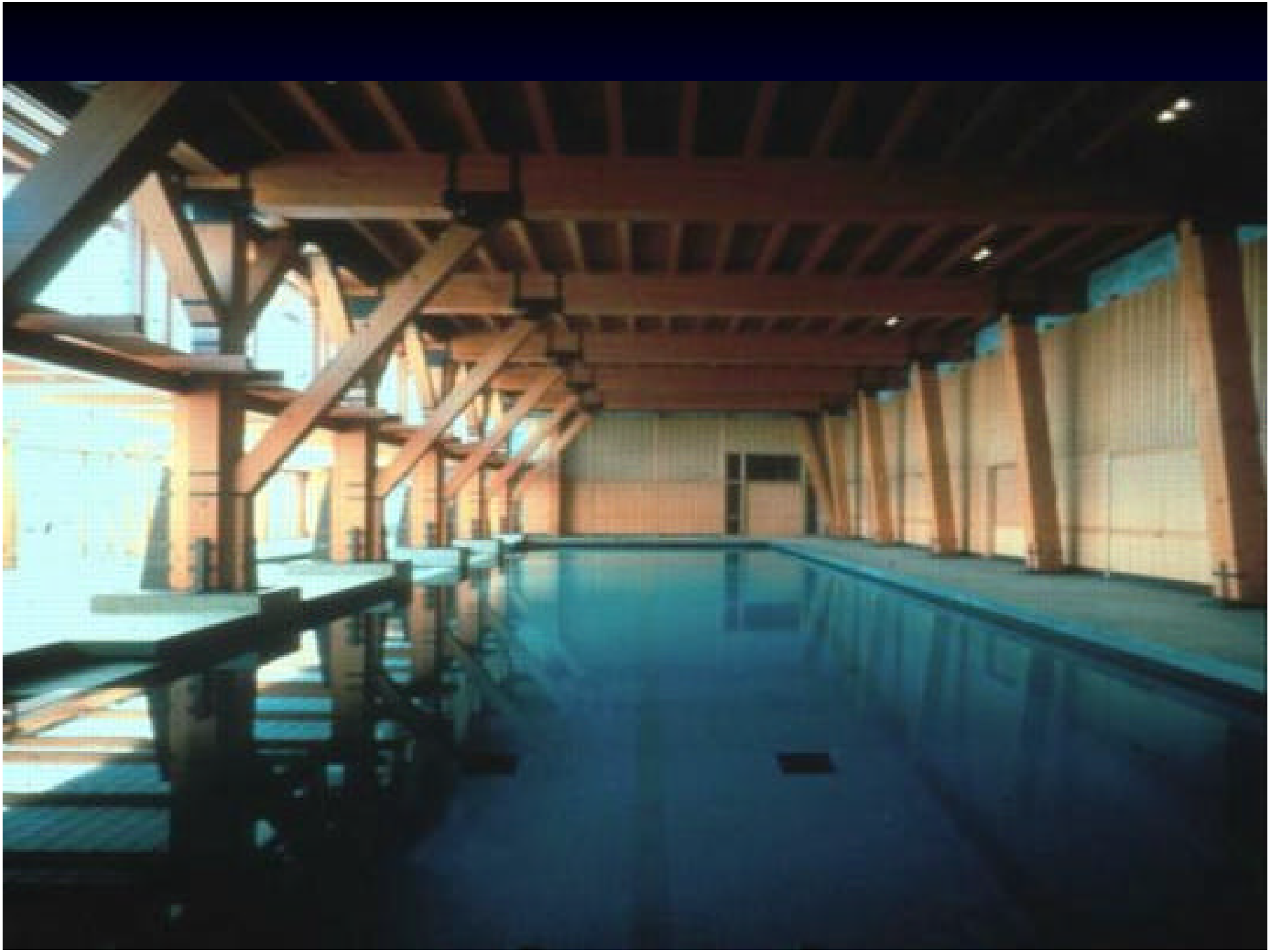
Why is the USDA Forest Service Interested in Deconstruction?

- Encourage the utilization of the total wood resource.
- Help preserve old growth timber.
- Develop sustainable construction material streams.

RF

Market Potential

- 3 trillion board feet of lumber and timber sawn since 1900 in USA.
  - Aging Infrastructure
- US Army BRAC sites: 250,000,000 bf
- Reclaimed timbers currently in demand for timber framing, flooring, molding.
- Reclaimed dimensional lumber use has great potential, but is currently limited.



Is the Wood in Military Buildings Valuable?

- $250 to $750 per thousand board-feet typical.

  (one board foot = 1 ft. x1 ft. x1 in. thick)
- Up to $11,000 per thousand board foot!
- Douglas-fir, Southern Pine most common.
- Longleaf SP has the highest value for flooring.

What is the Opportunity at Fort Chaffee?

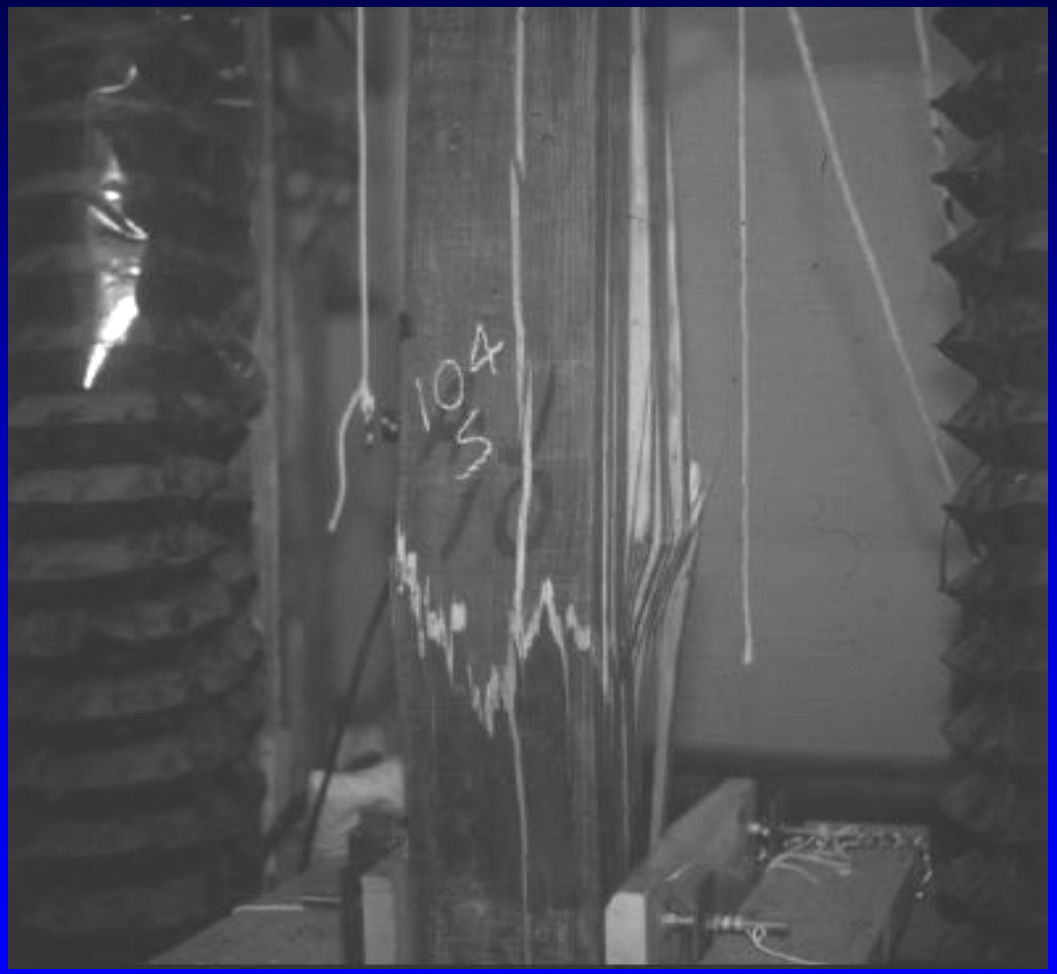
- Greater than 10,000,000 board feet of structural lumber, siding and flooring.
- Mostly Southern Pine
- Minimum value: $2,500,000

Increasing Marketability

- Need grade stamp specific to reclaimed lumber and timber.
- Determine engineering properties.
- Evaluate effects of deconstruction damage on engineering properties.

Strength Testing Old Lumber

Salvaged Wood Post at Failure on Test Machine



Defects in Salvaged Wood May Decrease Strength

Habitat for Humanity

- ReStore
  - Sell donated surplus building materials
  - Raise money for HfH primary mission
- Deconstruction Projects
  - Deconstructing houses in Austin area
  - Selling salvaged materials at ReStore

WB

House in Austin Under Deconstruction

Salvaged Lumber

ReStore Sales

1992 ACTUAL	$29,511
1993 ACTUAL	$127,826
1994 ACTUAL	$200,605
1995 ACTUAL	$332,762
1996 ACTUAL	$460,539
1997 ACTUAL	$596,018
1998 ACTUAL	$714,008
1999 BUDGET	$785,609
1999 ACTUAL	$733,676

1999 ReStore Sales (by weight)

ITEM	POUNDS
APPLIANCES	126,524
CABINETS	129,963
DOORS	419,609
ELEC./LIGHTS	61,473
FLOORING	132,200
TILE/BRICK	123,274
HARDWARE	75,525
LUMBER	154,327
ROOFING	49,727
PLUMBING	823,019
PAINT/DÉCOR	196,622
WINDOW/SCR.	146,136
PROMOTIONAL	7,116
MISC.	26,860
SPECIAL	32,609
TOTAL	2,504,984

Proposed Fort Chaffee Pilot Deconstruction Project

- Cooperative Project
  - Fort Chaffee Redevelopment Authority
  - USDA Forest Products Laboratory
  - University of Florida - Center for Construction and Environment
  - US Army Corps of Engineers - Construction Engineering Research Laboratories
  - Habitat for Humanity

RW

Specific Project Objectives

- Remove buildings in economic and environmentally sensitive manner
- Validate labor and execution time data for the deconstruction of typical military buildings.
- Train Habitat for Humanity staff and volunteers in deconstruction methods.
- Collect, grade, and test reclaimed lumber to establish the level of wood quality (and associated value).
- Develop policies, codes, and protocols (best practices) for deconstruction for wide Army use.

Contacts

- Bill Bowman, Austin Habitat for Humanity, 512-478-2165 x112, bcbowman@texas.net
- Steve Cosper, US Army Construction Engineering Research Lab, 217-398-5569, stephen.d.cosper@erdc.usace.army.mil
- Bob Falk, USDA Forest Service, Forest Products Lab, 608-231-9255, rfalk@facstaff.wisc.edu
- Brad Guy, U of FL Center for Construction and the Environment, 352-392-7502, minou@grove.ufl.edu
- Tom Napier, US Army Construction Engineering Research Lab, 217-373-3497, thomas.r.napier@erdc.usace.army.mil
- Phil Reeves, Fort Chaffee Redevelopment Authority, 501-452-4554, fcpt@ipa.net

Managing Lead Paint Building Waste

Rajani D. Joglekar
Office of Solid Waste
US Environmental Protection Agency

Army Worldwide Environmental and Energy Conference 2000
December 6, 2000

Purpose

- What has Federal agencies done for addressing lead paint hazards to children?
- Which lead paint building waste generation, management and reuse practices are regulated?
- How could recycling and reuse be an effective alternative to waste disposal?
- How can lead paint waste be recycled and/or reused pursuant to the Resource Conservation and Recovery Act (RCRA) mandate?

Background

- Federal health and environmental regulations applicable to **lead paint** in buildings include those of:
  - Environmental Protection Agency (EPA) pursuant to:
    - the Toxic Substances Control Act (TSCA) Title X mandates for addressing lead paint hazards in housing, public and commercial buildings, and superstructures; and
    - the RCRA mandate for managing hazardous and solid wastes
  - Housing and Urban Development (HUD)
  - Occupational Safety and Health Administration (OSHA)
  - Consumer Product Safety Commission (CPSC)
- Also, applicable are State RCRA and TSCA regulations
- Applicable standards for US bases abroad

EPA's Efforts to Minimize Lead Paint Hazards to Children

- Since 1995, EPA has developed TSCA certification and training standards for abatement and deleading of lead paint in buildings and superstructures (bridges, water towers)
- In 1998, EPA proposed:
  - TSCA standards for managing lead-based paint (LBP) debris from housing and public and commercial buildings
  - Temporary suspension from the toxicity characteristic (TC) rule for the waste that is subject to the TSCA standards
- Public comments wanted:
  - Minimal restrictions on recycling and reuse of LBP debris; and
  - EPA to also allow disposal of LBP debris in municipal landfills
- When finalized, States would have to adopt both regulations.

Building Activities Resulting in the Generation of Lead Paint Waste

- Abatement and deleading results in the generation of:
  - Paint chips and dust
  - Sludges and wastewater from paint stripping
  - Painted debris (doors, window frames)
- Renovation and remodeling activities produce:
  - Paint chips and dust
  - Painted and “clean” debris
  - Other building waste
- Demolition produces:
  - Large quantities of debris
  - Paint chips and dust as incidental waste
- Deconstruction produces:
  - Salvageable building components for reuse

Management of Lead Paint Waste under RCRA

- As of July 31, residential lead paint waste generated as household waste:
  - Must be disposed of in municipal solid waste (MSW) landfills.
  - May be subject to stringent State requirements (e.g., disposal of paint chips
- Lead paint waste may not be dumped or open burned.
- Until proposals become final, building waste remains subject to RCRA.
  - If hazardous:
    - Prior to land disposal, the waste must meet the treatment standards established pursuant to the land disposal restrictions enacted in 1984
    - Recycling is subject to hazardous waste recycling requirements
  - If nonhazardous it can be sent for:
    - Disposal in construction and demolition (C&D) or MSW landfills
    - Recycling for energy recovery or use as product (e.g., ground cover, landfill daily cover)
  - Non-hazardous painted debris may be reused in construction as "product" [CPSC regulations apply.]

Impediments to Recycling and Reuse of Lead Paint Building Waste

- Cross contamination during storage
- Lack of waste segregation results in cross contamination
- Liability concerns
- Lack of EPA Guidance on recycling and reuse of lead paint building debris in lieu of disposal under RCRA. [Note that CPSC has regulations for reuse of building components containing lead paint.]
- EPA encourages the regulated industry to develop such guidance for National distribution.

Recycling and Reuse: an Effective Alternative to Waste Disposal

- Increase potential for recycling/reuse by segregating the waste into:
  - Paint chips and dust
  - Lead pipes and plumbing equipment
  - Sludges from paint stripping, scraping, and sandblasting operations
  - Washwaters from cleaning/mopping of surfaces/floors
  - Painted debris
  - Decontaminated paint or debris removal equipment
  - Unpainted”clean” wooden or metal components
- Segregation may be labor intensive and cost prohibitive; however, increased potential for recycling/reuse can offset these costs.

Recycling and Reuse Alternatives for Lead Paint Building Waste as Household Waste

- Lead paint wood debris can be recycled for:
  - Energy recovery in waste-to-energy units subject to Clean Air Act regulations.
  - Lead recovery in lead smelters subject to Clean Air Act regulations.
  - Its use as ground cover or mulch provided that:
    - "Surfacial" paint is removed prior to shredding or mulching; and/or
    - Lead content is below the TSCA regulatory limit of 1 mg/cm^2 or 0.5% by weight
- It also can be reused provided that:
  - Painted surfaces are encapsulated;
  - "Surfacial" paint is removed; or
  - Used as internal building component as support material
- Onsite recycling of wash water from paint stripping may be appropriate.
- Individual States may restrict recycling/reuse of lead paint waste.

Recycling and Reuse Alternatives for Non-Household Lead Paint Building Waste

- As hazardous waste, recycling for energy and lead recovery is possible and remains subject to 40 CFR Part 266 standards.
- Recycling as scrap metal is appropriate - 40 CFR 261.6(a)(3)(ii)
- Individual States may have additional more stringent restrictions for recycling of lead paint building waste as hazardous waste.
- As solid waste, building debris may be recycled/reused in ways similar to the options discussed for household waste.
- Potential for lead exposure or release should be controlled.

Recycling and Reuse of C&D Waste

- Deconstruction followed by recycling/reuse can be an alternative to demolition.
- Development of deconstruction protocol that addresses lead exposure concerns and involvement of States is critical.
- EPA:
  - Encourages deconstruction/recycling and reuse over traditional demolition.
  - Is working with the US Army to institutionalize deconstruction.
  - Has developed a network of State, local, and NGO recycling market development professionals offering free business planning services and outreach efforts to those interested in used building material recycling.
  - Has given grants to produce outreach material on construction waste management practices.
  - Has given a grant to University of Florida to promote deconstruction, assist with deconstruction projects and develop a cost assessment tool.

FORT CHAFFEE

Redevelopment Authority

Questions/Comments?